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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/664,499	09/18/2000	Nicos A. Vekiarides	1942.0040000	4607

22879 7590 12/17/2003

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FORT COLLINS, CO 80527-2400

EXAMINER
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EL CHANTI, HUSSEIN A

ART UNIT	PAPER NUMBER
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2157

DATE MAILED: 12/17/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/664,499

Applicant(s)

VEKIARIDES, NICOS A.

Examiner

Hussein A El-chanti

Art Unit

2157

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 18 September 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-43 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 September 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. This action is responsive to application filed on Sep. 18, 2000. Claims 1-43 are pending examination.

#### ***Drawings***

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "814" and "816" have both been used to designate server and reference characters 820-832 have been used to designate disk array.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

#### ***Specification***

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-4, 7-9, 11, 12, 17-22, 24, 32 and 39 are rejected under 35 U.S.C. 102(e) as being anticipated by Shrivastava et al., U.S. Patent No. 6,606,643 (referred to hereafter as Shrivastava).

As to claim 1, Shrivastava teaches a method of mirroring data in a computer network, comprising the steps of:

establishing at least one connection between a local storage server and a mirror storage server (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11. col. 5 lines 23-33);

receiving a primary storage request from a network host at the local storage server (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11);

sending a mirror storage request across the established at least one connection from the local storage server to the mirror storage server, wherein the mirror storage request corresponds to the received primary storage request (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11);

processing the mirror storage request at the mirror storage server (see col. 7 lines 30-40);

sending a first heartbeat signal from the local storage server to the mirror storage server (see col. 5 lines 36-56); and

sending, a second heartbeat signal from, the mirror storage server to the local storage sever (see col. 5 lines 36-56).

As to claim 2, Shrivastava teaches the method of claim 1 further comprising the steps of:

detecting an interruption in the second heartbeat signal at the local storage server (see col. 6 lines 18-32);

closing the established at least one connection; and queuing mirror storage requests that result from primary storage requests that are received during the detected interruption (see col. 6 lines 18-32).

As to claim 3, Shrivastava teaches the method of claim 2, further comprising the steps of:

receiving the-second heartbeat signal at the local storage server after the detected interruption of the second heartbeat signal (see col. 7 lines 23-32); and

re-establishing the closed at least one connection between the local storage server and the mirror storage server (see col. 7 lines 23-32).

As to claim 4, Shrivastava teaches the method of claim 3, wherein said mirror storage request sending step comprises the step of:

sending the queued mirror storage requests across the re-established at least one connection after said re-establishing step (see col. 6 lines 18-32 and col. 7 lines 23-32).

As to claim 7, Shrivastava teaches the method of claim 1 wherein said processing step comprises the step of:

storing data of the received mirror storage request in a mirror storage device corresponding to a primary storage device (see col. 8 lines 48-col. 9 lines 18).

As to claim 8, Shrivastava teaches the method of claim 7, further comprising the step of:

sending a response across the established at least one connection from the mirror storage server to the local storage server, wherein the response indicates whether said storing data step was successful (see col. 9 lines 50-60).

As to claim 9, Shrivastava teaches the method of claim 5, wherein said establishing step comprises the steps of:

establishing  $n$  connections between the local storage server and the mirror storage server, wherein each of the  $n$  connections is between one of  $n$  worker threads in the local storage server and one of  $n$  connection threads in the mirror storage server, wherein  $n \geq 1$  (see col. 8 lines 48-col. 9 lines 18);

storing a local connection array of  $n$  elements on the local storage server, wherein each element of the local connection array corresponds to one of the  $n$  local worker thread that operates on the local storage server (see col. 8 lines 48-col. 9 lines 18); and

storing a mirror connection array of  $n$  elements on the mirror storage server, wherein each element of the mirror connection array corresponds to one of the  $n$  connection threads on the mirror storage server (see col. 8 lines 48-col. 9 lines 18).

As to claim 11, Shrivastava teaches the method of claim 10, wherein said establishing step further comprises the step of:

establishing each of the  $n$  connections according to the socket parameter stored in the corresponding one of the  $n$  elements of the stored local connection array (see col. 8 lines 48-col. 9 lines 18).

As to claim 12, Shrivastava teaches the method of claim 11, further comprising the steps of:

establishing a mirror heartbeat sender thread and a mirror heartbeat receiver thread in the mirror storage server (see col. 5 lines 36-56); and

establishing a local heartbeat sender thread and a local heartbeat receiver thread in the local storage server (see col. 5 lines 36-56).

As to claim 17, Shrivastava teaches the method of claim 16, further comprising the steps of

receiving a first message on the first heartbeat signal after an interruption of the first heartbeat signal (see col. 7 lines 23-32); and

re-establishing the  $n$  connections between the local storage server and the corresponding connection threads on the mirror storage server (see col. 7 lines 23-32).

As to claim 18, Shrivastava teaches the method of claim 17 wherein said second heartbeat signal receiving step comprises the step of:

receiving a first message on the second heartbeat signal after an interruption of the second heartbeat signal (see col. 7 lines 23-32).

As to claim 19, Shrivastava teaches the method of claim 1, wherein the local storage server is operating in an asynchronous mirror mode, further comprising the steps of:

processing the primary storage request (see col. 9 lines 20-61), and

sending the results of the processed primary storage request to the network host (see col. 9 lines 20-61).

As to claim 20, Shrivastava teaches the method of claim 1, wherein the local storage server is operating in a synchronous mirror mode, further comprising the steps of:

processing the primary storage request (see col. 9 lines 20-61);

waiting for a response corresponding to the sent mirror storage request from the mirror storage server (see col. 9 lines 20-61); and

sending the results of the processed primary storage request to the network host after the response is received from the mirror storage server (see col. 9 lines 20-61).

As to claim 21, Shrivastava teaches the method of claim 1, further comprising the step of:

determining whether a LUN related to the received primary storage request is designated to be mirrored (see abstract lines 1-8).

As to claim 22, Shrivastava teaches the method of claim 1, wherein the established at least one connection is a TCP connection (see col. 1 lines 20-30).

As to claim 24, Shrivastava teaches a method of bi-directional mirroring of data in computer networks, comprising the steps of:

establishing a first connection between a local storage server and a remote storage server (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11. col. 5 lines 23-33);



establishing a second connection between the local storage server and the remote storage server (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11. col. 5 lines 23-33):

receiving a first local storage request from a first network host at the local storage server (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11);

sending a first local mirror storage request from the local storage server across the first connection, wherein the first local mirror storage request corresponds to the first received local storage request (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11);

receiving the first local mirror storage request at the remote storage server (see col. 8 lines 48-col. 9 lines 18);

storing data received in the first local mirror storage request in at least one remote storage device coupled to the remote storage server (see col. 8 lines 48-col. 9 lines 18);

receiving a first remote storage request from a second network host at the remote storage server (see col. 8 lines 48-col. 9 lines 18);

sending a first remote mirror storage request from the remote storage server across the second connection, wherein the first remote mirror storage request corresponds to the received first remote storage request (see col. 8 lines 48-col. 9 lines 18);

receiving the first remote mirror storage request at the local storage server (see col. 8 lines 48-col. 9 lines 18); and

storing data received in the first remote mirror storage request in at least one local storage device coupled to the local storage server (see col. 8 lines 48-col. 9 lines 18).

As to claim 32, Shrivastava teaches a system for mirroring data in a computer network, comprising:

a local storage server that receives a storage request and outputs a mirror storage request, wherein said local storage server outputs a first heartbeat signal (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11. col. 5 lines 23-33); and

a mirror storage server that receives said mirror storage request, wherein said mirror storage server processes said mirror storage request, wherein said mirror storage server outputs a response corresponding to said mirror storage request to said local storage server, wherein said mirror storage server outputs a second heartbeat signal and receives said first heartbeat signal (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11. col. 5 lines 23-33, col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11);

wherein said local storage server receives said second heartbeat signal (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11).

As to claim 39, Shrivastava teaches a computer program product comprising a computer useable medium having computer program logic recorded thereon for enabling at least one processor to mirror data in a computer network, said computer program logic comprising:

means for enabling the processor to establish at least one connection between a local storage server and a mirror storage server (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11. col. 5 lines 23-33);

means for enabling the processor to receive a primary storage request from a network host at the local storage server (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11. col. 5 lines 23-33);

means for enabling the processor to send a mirror storage request across the established at least one connection from the local storage server to the mirror storage server, wherein the mirror storage request corresponds to the received primary storage request (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11. col. 5 lines 23-33);

means for enabling the processor to send a first heartbeat signal from the local storage server to the mirror storage server (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11); and

means for enabling the processor to send a second heartbeat signal from the mirror storage server to the local storage server (see col. 7 lines 9-16 and col. 7 lines 63-col. 8 lines 11).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 5, 6, 10 and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shrivastava in view of Emens et al., U.S. Patent No. 6,606,643 (referred to hereafter as Emens).

As to claim 5, Shrivastava teaches mirror storage request sending step comprises the step of sending the queued mirror storage requests across the re-established at least one connection after said re-establishing step (see the rejection of claim 4).

Shrivastava does not explicitly teach the limitation "detecting an interruption in the second heartbeat signal at the local storage server that has a duration longer than a first predetermined amount of time". However Emens teaches a method for automatically selecting a mirror server and detects an interruption in the second heartbeat signal at the local storage server that has a duration longer than a first predetermined amount of time (see col. 9 lines 33-45).

It would have been obvious for one of the ordinary skill in the art at the time of the invention to modify Shrivastava by implementing the step of detecting an interruption of a signal through a duration longer than a predetermined amount of time as taught by Emens because doing so would allow the user to terminate and re-establish communications which would result in faster communication in case the mirror server becomes off-line there is a failure in communication.

As to claim 6, Shrivastava teaches the method of claim 3, wherein said re-establishing step comprises the steps of:

re-establishing the closed at least one connection between the local storage server and the mirror storage server only if no interruptions in the second heartbeat signal are detected during said monitoring step (see col. 7 lines 23-32) and Emens teaches monitoring the second heartbeat signal for a probationary interval of time (see col. 9 lines 33-45).

As to claim 10, Emens teaches the method of claim 9, wherein said local connection array storing step comprises the step of

storing a local connection array of  $n$  elements wherein each element comprises a socket and a timestamp (see col. 3 lines 38-65 and col. 9 lines 32-67):  
and

wherein said mirror connection array storing step comprises the step of:

storing a mirror connection array of  $n$  elements, wherein each element comprises a socket parameter and a timestamp parameter (see col. 3 lines 38-65 and col. 9 lines 32-67).

As to claim 13, Emens teaches the method of claim 12, wherein the first heartbeat signal sending step and said second heartbeat signal sending step each further comprise the step of:

sending a message at time intervals of a second predetermined amount of time (see col. 9 lines 32-45).

As to claim 14, Emens teaches the method of claim 13, wherein said first heartbeat signal sending step further comprises the step of:

updating the timestamp parameter of each of the  $n$  elements of the mirror connection array whenever the message on the first heartbeat signal is received by the mirror heartbeat receiver thread; and

wherein said second heartbeat signal sending step further comprises the step of:

updating the timestamp parameter of each of the  $n$  elements of the local connection array whenever the message on the second heartbeat signal is received by the local heartbeat receiver thread (see col. 9 lines 32-67).

As to claim 15, Emens teaches the method of claim 14, wherein said detecting step further comprises the step of:

indicating in one of the  $n$  elements of the mirror connection array that the corresponding one of the established  $n$  connections is closed if the timestamp parameter of the one of the  $n$  elements is older than the first predetermined amount of time (see col. 9 lines 32-67).

As to claim 16, Emens teaches the method of claim 15, wherein said closing step comprises the steps of

timing out one of the  $n$  connection threads on the mirror storage server if a request on the corresponding one of the established  $n$  connections has not arrived in a third predetermined amount of time (see col. 9 lines 32-67); and

closing and exiting the timed out connection thread if the corresponding one of the  $n$  elements in the mirror connection array is indicated to be closed (see col. 9 lines 32-67).

6. Claims 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shrivastava in view of Emens further in view of Bennett, U.S. Patent No. 6,633,587.

Shrivastava and Emens teach sending a message at time intervals of a second predetermined amount of time. Shrivastava and Emens do not explicitly teach the limitation "sending UDP protocol message". However Bennett teaches a method for sending and receiving UDP messages between a host and a mirror server (see col. 5 lines 55-col. 6 lines 19).

It would have been obvious for one of the ordinary skill in the art at the time of the invention to modify Shrivastava by implementing the step of sending UDP messages as taught by Bennett because doing so would allow the user to send request to host servers more efficiently and in a faster manner.

7. Claims 25-31, 33-38 and 40-43 do not teach or define any additional limitation over claims 1-24 and therefor are rejected for similar reasons.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hussein A El-chanti whose telephone number is (703)305-4652. The examiner can normally be reached on Mon-Fri 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ario Etienne can be reached on (703)308-7562. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)305-3900.

Hussein El-chanti

Dec. 12, 2003

  
ARIO ETIENNE  
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